Sintered Inductive Metal Printer with Laser Exposure, Phase II

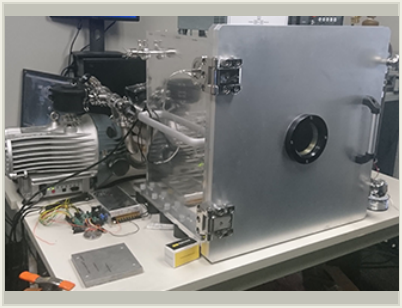
Completed Technology Project (2017 - 2020)

Project Introduction

Techshot's innovative 3D metal printer offers the unique ability to fabricate metal components and tools in space which can be utilized for sustainability, maintenance and research. The proposed system will accomplish this task through the utilization of a two-stage filament melting process whereby a metallic filament is first heated to Curie temperature through induction and then deposited on a build platform where it is fused to the previous layer by exposure to a low energy laser. This new unique process is known as Sintered Metal Printing with Laser Exposure (SIMPLE). Induction heating is not entirely new to Fused Deposition Manufacturing (FDM). There has been recent research into the integration of an induction coil into the "hot end" of a plastic filament FDM printer. The induction coil surrounds the metal nozzle, known as the "hot end" and inductively heats the nozzle when an AC current is applied. The nozzle then heats and melts the plastic filament allowing it to be extruded onto a platform where a part is formed. The use of induction heating, when printing with a metal filament, is similar but the induction coil heats the wire filament directly as it passes through its center. This system offers faster melt times resulting in faster feed rates, lower mass resulting in quicker more accurate printer head movements and lower overall power consumption. Conceptually, the wire filament will not be heated to melting but heated to the Curie temperature and laid as a hot filament on the build platform. To gain adherence between deposited layers, a low energy laser is used simultaneous to the layering process to heat and fuse adjacent filament layers.

Anticipated Benefits

Government customers will initially be from NASA, where it should be of keen interest to the Advanced Exploration Systems division and to scientists seeking to take advantage of Techshot's metal printer through NASA Research Announcements. Most beneficial for Exploration is the ability to print spare parts, logistics support and adaptive repair. Through its Space Act Agreement, its IDIQ contract and its role as a CASIS implementation partner, Techshot will offer both the SIMPLE equipment and the associated services required to conduct materials research and processing in microgravity aboard any NASA vehicles.Currently there is a high cost barrier to entry for 3D metal printing with no low cost options available. Techshot's SIMPLE metal printer will fill that void and be marketed as a low-end metal printer. Techshot has successfully commercialized technology derived from SBIR contracts. For example, spinoff company Techshot Lighting, LLC successfully manufactures an LED tent lighting system to military customers.



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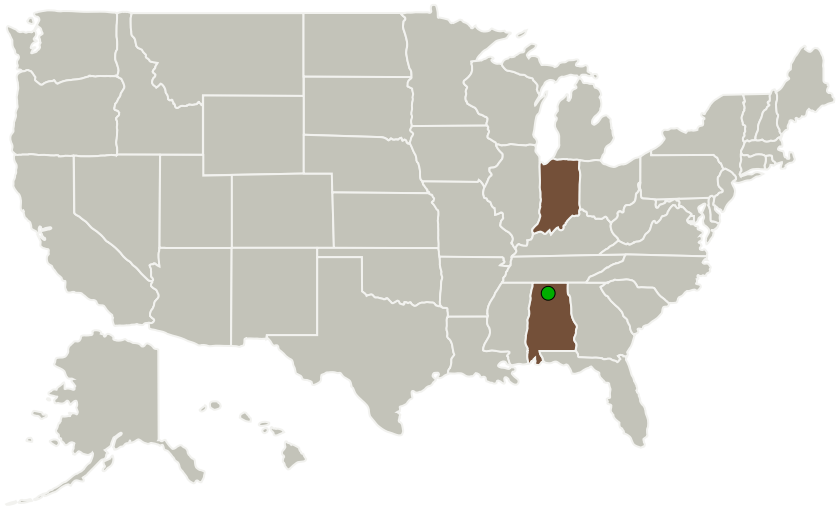
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Techshot, Inc.	Lead Organization	Industry	Greenville, Indiana
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Indiana

Project Transitions

April 2017: Project Start

January 2020: Closed out

Closeout Documentation:

- Final Summary Chart PDF*(https://techport.nasa.gov/file/141051)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Techshot, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Managers:

Gwenevere L Jasper
Tracie J Prater

Principal Investigator:

Eugene D Boland

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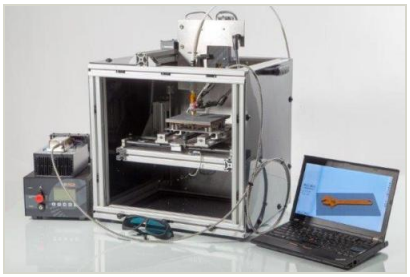
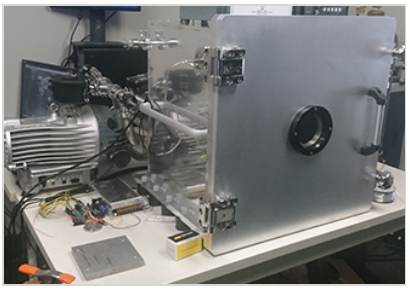
- Final Summary Chart*(https://techport.nasa.gov/file/141050)*

Images



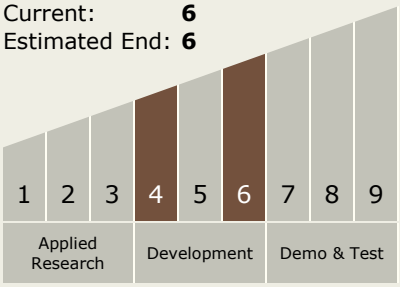
Briefing Chart Image
Sintered Inductive Metal Printer with Laser Exposure, Phase II Briefing Chart Image
(https://techport.nasa.gov/image/132648)



Final Summary Chart Image
Sintered Inductive Metal Printer with Laser Exposure, Phase II
(https://techport.nasa.gov/image/133578)

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System